

Message Text

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COME-00 DODE-00 EB-08 H-01 INR-07 INT-05 L-03

NSAE-00 NSC-05 OMB-01 PM-05 USIA-06 SP-02 SS-15

STR-06 TRSE-00 ACDA-12 CEQ-01 EPA-01 IO-13 NSF-01

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FM AMEMBASSY PARIS

TO DEPARTMENT OF ENERGY WASHDC

SECSTATE WASHDC 3521

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C O R R E C T E D C O P Y (PARA 2.B.,LINE 18:

"25 PCT" ADDED)

USEEC

DOE PASS TO SIEVERING;IA, VANDERRYN/IA, BEATTIE/CS;

USEEC FOR PURPLE

E.O. 11652: N/A

TAGS: TECH, ENRG, SENV, FR , US

SUBJECT: SOLAR ENERGY PROGRAM IN FRANCE?; A POTENTIAL
AREA OF EXPANDED COOPERATION WITH THE US.

REF: (A) PARIS 24866, (B) PARIS 28373, (C) PARIS 34872

1. FRANCE CONTINUES TO EMPHASIZE DEVELOPMENT OF THE
SOLAR ENERGY POTENTIAL AND FUNDS FORESEEN IN THIS SEC-
TOR HAVE BEEN INCREASED IN 1978 BY ABOUT 60 PCT (FROM
ABOUT 150 MILLION FRANCS IN 1977 TO 240 MILLION FRANCS

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IN 1978, I.E. FROM ABOUT \$30 MILLION TO CLOSE TO \$50

MILLION) INCLUDING AN INCREASE OF CLOSE TO 30 PCT IN

R & D (FROM ABOUT 105 TO 135 MILLION FRANCS). CENTRE

NATIONAL DE LA RECHERCHE SCIENTIFIQUE (CNRS) ALSO

CONTINUES TO BE INTERESTED IN EXPANDING THE

BILATERAL R & D COOPERATION WITH THE US IN AREAS NOT

INVOLVING COMMERCIAL CONFRONTATION. THE GREATEST

EFFORT OF THE FRENCH R & D PROGRAM IS ORIENTED TO A DEVELOPMENT OF COMMERCIALY EXPORTABLE SOLAR THERMAL ELECTRIC PLANTS AND THIS PROGRAM IS GIVEN PARTICULAR COVERAGE IN THIS CABLE.

2. SOLAR PROGRAM OVERVIEW:

A. THE SOLAR R & D PROGRAM IS LED BY CNRS' STAFF RESPONSIBLE FOR THE PROGRAMME INTERDISCIPLINAIRE DE RECHERCHE POUR LE DEVELOPPEMENT DE L'ENERGIE SOLAIRE (PIRDES). IN 1977 THIS PROGRAM INVOLVED APPROXIMATELY 225 TECHNICAL AND ADMINISTRATIVE PEOPLE. MOST OF THESE ARE DISPERSED IN SEVERAL LABORATORIES (PRINCIPAL ONES ARE LOCATED AT ODEILLO, POITEIERS, MARSEILLE AND TOULOUSE). PIRDES HAS COOPERATION AGREEMENTS WITH EDF, CEA AND CNES, AIMED RESPECTIVELY AT DEVELOPMENT OF CENTRAL TOWER RECEIVER PLANTS, THERMO-DYNAMIC CONVERSION AND PHOTOVOLTAIC CONVERSION. THEY ALSO HAVE SEVERAL FOREIGN COOPERATION AGREEMENTS INCLUDING ONE WITH THE US (SEE REFTTEL B) AND SEVERAL WITH LDCS (I.E., ALGERIA, BRAZIL, IRAN AND INDIA). FRANCE IS INVOLVED IN THE EUROPEAN COMMUNITIES' (EC) SOLAR PROGRAM, INCLUDING THE PLANNED SOLAR THERMAL ELECTRIC PROJECT IN SICILY. HOWEVER, FRANCE DOES NOT PARTICIPATE IN IEA ACTIVITIES AND ITS SOLAR ENERGY EFFORTS, EXCEPT FOR OBSERVOR CONTACTS THROUGH EC.

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B. SO FAR, ONLY SOLAR WATER HEATING IS CONSIDERED TO HAVE DEMONSTRATED ECONOMIC POTENTIAL IN FRANCE, BUT ALL OTHER AREAS OF SOLAR DEVELOPMENT AND DEMONSTRATION ARE PURSUED INCLUDING SOLAR RESIDENTIAL HEATING, THERMAL CONVERSION ELECTRIC GENERATION, AND PHOTOVOLTAIC ENERGY GENERATION. THERMAL-ELECTRIC GENERATION IS CONSIDERED TO APPROACH ECONOMIC COMPETITIVENESS IN SOME REGIONS OF THE WORLD AND TO HAVE NEAR-TERM EXPORT POTENTIAL (TO COUNTRIES WHERE SUN AVAILABILITY CHARACTERISTICS ARE FAVORABLE, FUEL TRANSPORT COSTS ARE HIGH, AND RELATIVELY SMALL DECENTRALIZED PLANTS CAN BE OF INTEREST). ALSO, AS PRODUCTION OF SUCH UNITS WILL PROGRESS, IT IS EXPECTED THAT THEIR COSTS WILL FALL, MAKING THEM ECONOMIC IN SOME REGIONS OF FRANCE (ALTHOUGH A COST REDUCTION OF A FACTOR OF FIVE OR MORE APPEARS NEEDED FOR THIS.) PHOTOVOLTAIC SOLAR GENERATION BENEFITS FROM ABOUT 25 PCT OF THE R & D BUDGET AND A LARGER FRACTION OF THE PIRDES STAFF EFFORT. IT IS CONSIDERED TO BE THE BEST

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BET FOR THE LONG TERM, BUT FRANCE APPEARS TO BE LESS
OPTIMISTIC THAN THE US ON THE LIKELY SPEED OF PROGRESS
AND NEAR-TERM POTENTIAL OF THIS APPROACH. (THEY ESTI-
MATE THAT 20 YEARS MAY BE REQUIRED FOR GOALS CONSIDERED
ATTAINABLE IN THE US BY 1983-1985).

C. THE 240 MILLION FRANCS PROGRAM, FOR SOLAR
ENERGY IN 1978, CAN BE BROKEN DOWN APPROXIMATELY AS
FOLLOWS: 108 MILLION FRANCS FOR DIRECT R & D GOVERNMENT
SUPPORT; 25 MILLION FRANCS FOR SUPPORT OF DEMONSTRATIONS
BY THE MINISTRY OF INDUSTRY; 7.5 MILLION FRANCS CHANNEL-
LED THROUGH THE MINISTRY OF COOPERATION (MOSTLY TO FOR-
MER COLONIES); 20 MILLION FRANCS CONTRIBUTED BY
ELECTRICITE DE FRANCE; AND 80 MILLION FRANCS EXPECTED
CONTRIBUTION FROM INTERESTED INDUSTRY AND PUBLIC INSTI-
TUTIONS (SOME, PROBABLY INFLATED, ESTIMATES CONSIDER
THIS MAY AMOUNT TO 100 MILLION FRANCS WHICH WOULD
INCREASE THE OVERALL FUNDING TO 260 MILLION FRANCS).

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3. THE SOLAR THERMAL ENERGY CONVERSION EFFORT:

A. THE FRENCH SOLAR THERMAL ENERGY CONVERSION R & D PROGRAM IS IN HIGH GEAR AND MAKES AN EXCELLENT IMPRESSION IN TERMS OF CAPABILITY OF THE PARTICIPANTS, THE SOUNDNESS OF THE PLANNING, AND ACHIEVEMENTS TO DATE. AS IN THE US, THIS WORK IS FOCUSED ON TWO SYSTEM DESIGNS: THE CENTRAL TOWER RECEIVER, CONSIDERED CAPABLE OF RELATIVELY HIGH POWER CAPACITY, AND THE DISTRIBUTED COLLECTOR SYSTEM FOR LOWER POWER CAPACITIES. MOST OF THE CURRENT EFFORT IS CARRIED OUT AT THE ODEILLO LABORATORY IN THE PYRENEES, AT THREE TEST SITES IN THE MARSEILLE AREA, AND AT THE EDF, CHATOU CENTER NEAR PARIS.

B. ODEILLO PROGRAM. FRANCE STARTED ITS SOLAR EFFORT IN 1946. THIS LED (UNDER THE IMPETUS OF THE MILITARY PROGRAM) TO COMPLETION OF CONSTRUCTION IN 1968 AT ODEILLO OF THE WORLD'S FIRST MAJOR SOLAR FURNACE (ABOUT ONE MEGAWATT CAPACITY AND ABLE TO PRODUCE TEMPERATURES OF 6,850 DEGREES F.)

CURRENTLY, THERE IS A SOLAR LABORATORY AT ODEILLO WITH A STAFF OF ABOUT 40, WORKING IN CONJUNCTION WITH AN ADDITIONAL STAFF OF ABOUT 20 AT THE

UNIVERSITY OF POITIERS, AND FUNDED AT A YEARLY LEVEL OF ABOUT 7 MILLION FRANCS. IN LARGE PART THE EFFORT IS IN SUPPORT OF THE SOLAR THERMAL CONVERSION PROGRAM. THE WORK INCLUDES 18 PROJECTS DEVOTED MAINLY TO HELIOSTAT AND SOLAR BOILER DESIGN AND OPTIMIZATION, PROBLEM AREAS SUCH AS ENERGY STORAGE AND WIND LOSSES, AND GENERAL SUPPORT OF SOLAR APPLICATIONS (INCLUDING SUCH ITEMS AS SOLAR REFRIGERATION, ADVANCE HEAT TRANSFER SYSTEMS AND SOLAR MEASUREMENTS). AS PART OF THE ABOVE EFFORT (WITHIN THE FRAMEWORK OF A PAST AGREEMENT LIMITED OFFICIAL USE

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WITH ERDA) A US SOLAR FURNACE WAS TESTED AT NOMINAL POWER DURING A 3-MONTH PERIOD IN 1976, SO AS TO COM-
-ARE ITS PERFORMANCE WITH TESTS AT SANDIA WHICH HAD INVOLVED ARTIFICIAL LAMP HEATING.

IN THE FUTURE, FRENCH PLANS CALL FOR USE OF THE ODEILLO FACILITY FOR MAJOR TESTS SUPPORTING THE FRENCH THEK SOLAR PLANT DESIGN (SEE 3D BELOW) AND OTHER EFFORTS NOT DIRECTLY RELATED TO ENERGY PRODUCTION, SUCH AS HIGH TEMPERATURE MATERIALS PROCESSING, THERMAL

SHOCK, THERMO-CHEMISTRY, ETC. THE ODEILLO FACILITY WAS BUILT TO ACHIEVE ITS HIGH DESIGN TEMPERATURE AND IT IS NOT OPTIMIZED FOR ECONOMIC SOLAR ENERGY PRODUCTION. CURRENTLY, THE SOLAR FURNACE IS CAPABLE OF OPERATING ONLY AT PARTIAL POWER AS THE VARNISH OF THE BACK SIDE OF ITS MIRRORS HAS DETERIORATED AFTER TEN

YEARS OF WEATHERING. IT IS PLANNED TO REVARNISH THE MIRRORS AND THIS WILL INVOLVE A MAJOR EFFORT REQUIRING REBAKING.

C. THEM PROGRAM. THE MOST IMPORTANT ELEMENT OF THE FRENCH THERMAL-ELECTRIC GENERATION EFFORT IS THE THEM PROGRAM (FROM THERMO-HELIO ELECTRIC, MEGAWATT) AIMED AT DEVELOPMENT OF RELATIVELY LARGE SOLAR PLANTS IN THE 10-20 MWE RANGE. RECENTLY, AS PART OF THIS EFFORT, CONSTRUCTION OF THEM I (A CENTRAL TOWER RECEIVER SYSTEM ALSO CALLED "THEMIS") HAS BEEN COMMITTED. THE EFFORT IS RUN BY A CNRS/EDF PROJECT TEAM LOCATED AT THE EDF CHATOU LABORATORY AND INDUSTRY

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PARTICIPATES THROUGH INVOLVEMENT OF AN INDUSTRIAL GROUP CALLED "CETHEL" (FROM CENTRALES THERMAL-HELIO ELECTRIQUES) AND COMPOSED OF FIVES - BABCOCK, HEURTEY, ST. GOBAIN AND SERI-RENAULT.

THEMIS WILL BE A 2 MWE PLANT (3 MWE PEAK) WITH 360 MIRRORS OF ABOUT 50 METERS SQUARE, EACH USING HITEC COOLANT, AND WILL PROVIDE SIX HOURS DESIGN POWER STORAGE CAPACITY TO MEET THE DEMAND

EXPECTED IN POTENTIAL AFRICAN MARKET AREAS. IT WILL OPERATE INITIALLY AT A MAXIMUM STEAM TEMPERATURE OF ABOUT 420 DEGREES C. AND WILL UTILIZE AN EXISTING TURBINE FOR AN EXPECTED EFFICIENCY OF ABOUT 26 PCT ALTHOUGH THIS HAS NOT BEEN DECIDED, IT IS EXPECTED THE PLANT WILL BE LOCATED AT AN EDF SITE NEAR MARSEILLE (ST. CHAMAS). THE PROJECTED COST IS 60 MILLION FRANCS AND INITIAL OPERATION OF THE PLANT IS EXPECTED IN 1980.

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THE INITIAL TEST PROGRAM WILL VERIFY THERMAL SYSTEM PERFORMANCE, PROVIDE EXPERIENCE ON MANAGEMENT OF THE HELIOSTAT FIELD, AND TEST CAPABILITY TO PROVIDE A RELIABLE ELECTRIC SUPPLY FROM THE PLANT AND ITS STORAGE SYSTEM. SUBSEQUENTLY, IT IS EXPECTED THAT THE PLANT WILL BE USED AS A TEST BED FOR MORE ADVANCED COMPONENTS. STEAM TEMPERATURE WOULD PROBABLY BE RAISED TO 500 DEGREES C. IN CONJUNCTION WITH A DEVELOPMENTAL 120 BAR RADIAL TURBINE, LEADING TO AN EFFICIENCY OF 33 PCT OR HIGHER. AT A LATER TIME A GAS TURBINE MAY BE TESTED.

AS PART OF THE PROGRAM, FOUR DIFFERENT TYPES OF HELIOSTATS HAVE BEEN TESTED AT AN EDF SITE NEAR MARSEILLE (MARTIGUES). TWO OF THESE ARE FAVORED NOW (ONE OF WHICH IS SIMILAR TO THE US MCDONNELL-DOUGLASS DESIGN) AND TWO CONTROL METHODS (TELESCOPIC TRACKING AND COMPUTER) HAVE BEEN FOUND ACCEPTABLE. THE FINAL CONSTRUCTION CHOICE IS TO BE BASED ON COST PROJECTIONS, BUT TWO TYPES OF HELIOSTATS MIGHT BE USED TO GET FURTHER EXPERIENCE ON BOTH.

AS LISTED UNDER 5B BELOW, THREE REPORTS ON THE THEM PROGRAM WILL BE POUCHED SEPARATELY. THESE

INCLUDE: (1) A PROGRAM SUMMARY, (2) A DESCRIPTION OF THE THEM PROGRAM DESIGN AND EVALUATION STUDIES WHICH HAVE BEEN CARRIED OUT, AND (3) THE PRELIMINARY DESIGN OF THEM I. ALTHOUGH THE REPORTS ARE RECENT (FEBRUARY 1977) THE PRELIMINARY DESIGN REPORT IS PARTIALLY OBSOLETE IN THAT THE PROJECT WAS LAUNCHED ON A SCALED DOWN COST BASIS, WHICH FORCED A REDUCTION OF THE POWER RATING FROM THREE TO TWO MWE. A CORRECTED REPORT IS EXPECTED TO BECOME AVAILABLE IN A FEW MONTHS. THESE REPORTS CONTAIN PRIVILEGED INFORMATION, HAVE A LIMITED OFFICIAL USE

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RESTRICTED CIRCULATION, AND SHOULD BE TREATED ACCORD-
INGLY.

D. THEK AND PERICLES PROJECTS. THE OTHER TWO
ELEMENTS OF THE THERMAL/ELECTRIC GENERATION PROGRAM
ARE THE THEK (FROM THERMO-HELIO ELECTRIC, KILOWATT)
AND PERICLES PROJECTS. THEY FOCUS ON THE DISTRIBUTED
COLLECTOR SYSTEM AND ARE AIMED AT LOWER ENERGY GENER-
ATION CAPACITY. BOTH SYSTEMS ARE BEING DEVELOPED

NEAR MARSEILLE. THE THEK PROJECT TESTS ARE CARRIED
OUT BY A CNRS/UNIVERSITY OF MARSEILLE TEAM, AND
PERICLES DEVELOPMENT IS CENTERED AT THE SPACE-
ASTRONOMY LABORATORY.

UNDER THE THEK PROJECT, TWO TYPES OF COLLEC-
TORS ARE TO BE TESTED EARLY IN 1978. SUBSEQUENTLY,
A 100 KWE SYSTEM COMPOSED OF 25 UNITS WILL BE ASSEMBLED
AND STUDIED, PERHAPS BY MID-1979. TO THE EXTENT
PRACTICAL THEM PROGRAM TECHNOLOGY WILL BE USED.
HOWEVER, SINCE THEK TRACKING REQUIREMENTS ARE LESS
STRINGENT DIFFERENT CONTROL SYSTEMS WILL BE TRIED.

AT THE UNIVERSITY OF MARSEILLE THERE IS ALSO
A GENERALIZED SOLAR R & D EFFORT. IT IS FOCUSED ON
DEVELOPMENT OF IMPROVED COLLECTOR SURFACES. THE
INTENT IS TO MINIMIZE RADIATION AND CONVECTION LOSSES
AND ALLOW UTILIZATION OF SOMEWHAT HIGHER TEMPERATURE
ENERGY COLLECTOR PLATES THAN PRESENTLY PRACTICAL.

THE PERICLES PROJECT IS AIMED AT THE DEVEL-
OPMENT OF A STATIONARY AND SPHERICAL COLLECTOR WITH A

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MOVING FURNACE. IT IS BELIEVED SUCH A SYSTEM MAY BE COMPETITIVE IN TROPICAL REGIONS. A MINI-PERICLES WITH A 10-METER DIAMETER MIRROR HAS BEEN BUILT AND VERY RECENTLY UNDERWENT MOONLIGHT TESTS TO VERIFY CALCULATIONS AND TO ADJUST CONTROLS. THE NEXT STEP MIGHT BE A 75 KW(E) UNIT, AND A PRELIMINARY DESIGN HAS BEEN MADE OF A L.5-3 MW(T) SYSTEM. REPORTEDLY, INDIA IS INTERESTED IN THE PERICLES DESIGN AND THERE HAVE BEEN DISCUSSIONS WITH FRANCE RELATIVE TO CONSTRUCTION OF SUCH A UNIT IN INDIA.

4. SUGGESTED EXPANSION OF R & D COOPERATION:
ON SEVERAL OCCASIONS KEY FRENCH SOLAR PROGRAM STAFF HAVE EXPRESSED INTEREST IN INCREASING BILATERAL SOLAR PROGRAM COOPERATION WITH DOE. AS DISCUSSED IN REFTEL C, SPECIFIC SUGGESTIONS INCLUDE A JOINT SOLAR PROGRAM IN LDC AREAS, JOINT SPONSORSHIP IN LIMITED OFFICIAL USE

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ABOUT ONE YEAR OF AN INTERNATIONAL SYMPOSIUM ON

THERMAL CONVERSION ELECTRIC GENERATION SYSTEMS, AND COOPERATION ON THE DEVELOPMENT OF PERICLES TYPE PLANTS. OTHER TOPICS MENTIONED IN THE PAST INVOLVE COOPERATION IN STUDIES OF WIND LOSSES AND PARABOLIC COLLECTORS.

5. ADDITIONAL REFERENCE INFORMATION:
A. THE ABOVE INFORMATION COMPLEMENTS REFTELS AND PROVIDES ADDITIONAL BACKGROUND. IT IS BASED ON: (1) DISCUSSIONS WITH M. RODOT, DIRECTOR OF PIRDES, C. ETIEVANT, CNRS PROJECT MANAGER OF THEM; (2) VISITS TO THE ODEILLO LABORATORY, TO THE THREE TEST SITES NEAR MARSEILLE (UNIVERSITY OF PROVENCE, ASTRONOMIE-SPATIALE, AND MARTIGUES) AND TO THE EDF, CHATOU CENTER; AND (3) INFORMATION IN FILES.
B. REPORTS OBTAINED AS A RESULT OF THE ABOVE CONTACTS AND VISITS WILL BE POUCHED SOONEST TO VANDERRYN, DOE. MOST OF THESE ARE IN FRENCH.

THEY INCLUDE:

(1) ELECTRICITE SOLAIRE, REALISATIONS ET PROJETS FRANCAIS, F. PHARABOD, SEPTEMBRE 1977.

(2) PIRDES, ACTIVITES EN COURS AU 1ER
JUILLET 1977.

(3) PROJET THEM, SOMMAIRE, C. ETIEVANT AND
F. PHARABOD, FEBRIER 1977 (RESTRICTED CIRCULATION).

(4) PROJET THEM, ETUDES GENERALES SUR LES
CENTRALES SOLAIRES A TOUR, FEVRIER 1977, THEM 77-02
(RESTRICTED CIRCULATION).

(5) PROJECT THEM, CENTRALE SOLAIRE EXPERI-
MENTALE, AVANT PROJET THEM 1, FEVRIER 1977, THEM 77-03
(RESTRICTED CIRCULATION).
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(6) PROGRAMME THEK, PIRDES, UNIVERSITE DE
PROVENCE, SEPTEMBRE 1977.

(7) ETUDE OPTIQUE DES CAPTEURS SOLAIRES

SPHERIQUES FIXES, P. AUTHIER, LABORATOIRE D'ASTRONOMIE
SPATIALE, JUIN 1976 PRC/76/01.

(8) PERICLES, DESIGN OF A STATIONARY SPHERI-
CAL COLLECTOR, B.F. AUTHIER, JUILLET 1977, 77/PE/27.

(9) LA CONVERSION THERMIQUE DE L'ENERGIE
SOLAIRE, UNIVERSITE DE PROVINCE, SEPTEMBRE 1977.

(10) COMPTE RENDU D'ACTIVITE MARS 1976-
FEBRIER 1977, LABORATOIRE D'ENERGETIQUE SOLAIRE,
CNRS, ODEILLO.

(11) THE FRENCH CNRS 1000 KW SOLAR FURNACE
DESCRIPTION, PERFORMANCE CHARACTERISTICS PRESENT
UTILIZATIONS AND PERSPECTIVES, F. TROMBE, ET AL,
ODEILLO (PRESENTATION AT THE NATIONAL SCIENCE
FOUNDATION INTERNATIONAL SEMINAR OF NOVEMBER 18, 1974).

6. REQUEST FOR GUIDANCE: WOULD APPRECIATE DEPARTMENT
AND DOE CONSIDERATION AND ADVICE ON POTENTIAL FUTURE
COOPERATION STEPS ADDRESSING THE SPECIFIC CNRS SUGGES-
TIONS DISCUSSED IN REFTTEL C AND PARA 4 ABOVE. HARTMAN

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Message Attributes

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Disposition Case Number: n/a
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Disposition Reason:
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